38.3 lbs.; excreted 31 lbs. daily. The temperature was 12.7° lower than in the previous period, or 61.5°. The food and water taken were 195 lbs.; excrements, 136 lbs.; increase of body weight, 55 lbs.; excess of ingesta over egesta, plus increase of body weight, per day 6 lbs. Less than a pound of urine was found in the pan, although the manure was kept removed so that it could not absorb urine. Less was eaten, less drank, less excreted; less was exhaled than in previous or any other trial, while there was more increase of body weight. This result is in conflict with others, unless we assume that the lower temperature accounts for the decreased exhalation and increased body weight by temporary increase of water in the system while seeking an increased movement in another direction. I have no doubt that fluctuations of body weight occur from this cause, and the attention of experimenters in feeding is called to the fact. We have found that:—

With 6 lbs. cob meal,			28.0 lbs.	water	are	drank	and	13.6 lbs.	are	exhaled,	at a	temperature of	71.0 deg.
"	"	middlings,	26.5	"	"	"	"	9.2	"	"	"	"	72.8 "
"	"	"	20.0	"	"	"	"	11.3	"	"	"	"	72.8 "
"	5 lbs.	hay,	29.0	"	"	"	"	15 7	"	"	"	"	75.3 "
"	9½ "	"	42.5	"	"	"	"	23.3	"	"	"	"	72.2 "
"	10 "	"	38.3	"	"	"	"	6.0	"	"	"	"	61.0 "

As the temperature varies, the amount of water drank varies, being probably about 60 to 80 pounds more in summer than in winter.. The figures above show that, the temperature remaining the same, an increase of food is accompanied by an increased exhalation of water. This is to be expected, as more heat would be produced in the system and more evaporation would be needed to maintain the normal temperature of the body. The larger and more bulky the food ration, the greater the amount of water drank, and the larger will be the proportion excreted with the solids. It seems to me quite probable that a limited ration of coarse food with grain is more economical than a heavy ration of coarse food. This requires less water, less exhalation, and excreting more by the kidneys. The fact has been noted by others that the character of the urine varies with the food.

TESTING SEEDS AT CONSTANT TEMPERATURES.

W. J. BEAL.

J. L. Campbell, of West Elizabeth, Penn., manufactures an incubator or egg-hatcher which is intended to run at a uniform temperature for some days. He made a machine on the same plan for testing seeds. It is heated by an ordinary number two kerosene hand lamp. The room or box containing the seeds also contains a band of metal, fastened by each end to a board. When warm, the metal expands and bends, as the two ends are stationary. This band of metal is connected by a series of delicate levers with a trap door, which is opened or closed, more or less, to control the draft of the lamp. Sometimes the tester has not been seen to vary more than one degree or two in several days, at other times more. This machine, after some tinkering, was used in making the tests mentioned below. I had anticipated, in particular, to test dent corn raised in Mississippi or Texas for some years, by the side of dent corn raised for some years in Michigan; but the seed from the South was more or less infested with insects So it was impossible always to tell which seeds were sound and which were unsound. This test was not satisfactory, as will be seen.

On June 30th, nine candy jars,

holding about two quarts each, were half or two-thirds filled with damp sand. Each jar contained 20 kernels of good dent corn, grown at the college on the previous year. Previous experiments showed that the corn was in good condition for germination. The temperature was kept at 130° F. In one jar, seven kernels sprouted. None of the rest started. There were 180 kernels in all.

On July 6th, in the same jars of moist sand, the following seeds were tested. In this case, the weather varied considerably and the thermometer in the seed box varied more than usual, from 117° to 123° F. There were 50 kernels of sound dent corn from Michigan, 50 kernels of sound dent corn from Mississippi, 50 kernels of sound dent corn from Texas, 100 seeds of Turban squash—good seeds, 50 seeds of Crook Neck squash, and 50 seeds of nutmeg melon. Not one seed grew.

On July 20th, the following seeds were tested in the manner above described, with the thermometer ranging from 110° to 115° F. 50 college nutmeg melon seeds all grew, 100 per cent; 50 white spine cucumber, all failed, 0 per cent; 50 Turban squash, all failed, 0 per cent; 50 kernels of Texas dent corn, 5 grew, 10 per cent; 50 kernels of Mississippi dent corn, 16 grew, 22 per cent; 50 kernels Michigan dent corn all grew, 100 per cent. The young seedlings, in all cases, soon showed signs of too great heat and died. It will be interesting to notice that the dent corn of Michigan stood a higher heat than the southern corn, which doubtless possessed a weaker vitality. Also, observe that all the college seeds of melons germinated; that all the seeds of cucumbers and turban squash failed. There is something unsatisfactory about the test. Possibly it may be in the supply of air.

On June 26th, 9 jars contained each 20 kernels, 180 in all, of good Michigan dent corn; temperature 100° F. All the kernels but one grew.

On July 27th, the following were tested at 95° to 100° F.: 50 white spine cucumber, grown by or sold by Sibley of Rochester, 10 grew, 20 per cent; 50 nutmeg melon, grown by or sold by Sibley of Rochester, 22 grew, or 44 per cent; 50 early frame cucumber, grown by and sold by Sibley of Rochester, 11 per cent grew; 30 white bush squash, grown by or sold by Sibley of Rochester, 60 per cent grew; 50 white spine cucumber (D. M. Ferry), 40 per cent grew; 100 nutmeg melon (D. M. Ferry), 67 per cent grew; 50 Turban squash, good seeds, grown by Michigan Agricultural College, 66 per cent grew. These experiments, at uniform or nearly uniform temperatures, need repeating.

VARIATION OF RED CLOVER.

For the past two years, I have been studying hundreds of plants of red clover at all seasons and stages of growth. I have marked and saved seeds of some twenty-five plants which have shown the most distinct and widely different peculiarities. Of course, we all know that soil and the distance the plants grow from each other have very much to do with the growth of the plants, but these different conditions cannot be considered as entirely the cause of the present difference in the plants.

1. Individual plants show considerable difference in the earliness of growth in spring and after cutting. This is especially true of the stems, which finally bear the heads of flowers. Some plants may be seen in Central Michigan by the first of June on ordinary seasons, while other plants are nearly or quite four weeks later. A considerable portion of this chapter was presented at the Montreal meeting of the Society for the Promotion of Agricultural Science.

2. Some plants stool out and send up many stalks; others, few.

3. On hot, dry days, some plants wilt, while others show no signs of wilting.

4. There is a great difference in

the heights of plants, even where the soil appears to be uniform.

5. Some grow erect, even where there is nothing to crowd them; others spread out at once, making a very small angle with the ground.

6. Some stems are large, others slender.

7. Some plants are densely pubescent, others are nearly smooth, and between these are all gradations. In this respect, the same plant varies with the season.

8. The stems of some are pure light green or dark green, or tinged with purple, or even dark purple throughout.

9. The stems vary much in the length of internodes and length and number of branches.

10. On some plants the leaves are dark green, smooth and thick, with no trace of light colored spots. On others, the leaves are light colored, with or without spots, of variable size and shape. Some leaves are thin and flabby.

11. Some coplets are very wide in proportion to the length, others very narrow; and between these are all gradations.

12. The stipules vary in shape and color and in the position taken in regard to the main axis. Some clasp the main axis with the tips. In other cases, the tips of the stipules stick out from the stem. One plant seen had stipules conspicuously red in stripes.

13. The heads of the flowers, so far as seen, were sessile, with an involucre of leaves, which have coplets varying much in width.

14. The heads vary much in size and somewhat in shape.

15. The tube and the lobes of the calyx vary in hairyness and somewhat in size.

16. The petals vary in length and in direction taken. Some are scarlet, others pink, some pale pink, some creamy white, some erect and quite close together, others more spreading.

17. Varying with the season and perhaps the plant, the pistils contain from 0 to 2 or 3 or even 4 seeds each.

18. Some seeds are dark purple, others light yellow; between these are all gradations.

Plant number 1—is early, has the stems few and small, erect, quite hairy, purplish; coplets spotted, rather narrow; coplets of the involucre lance-elliptical.

Plant number 3—is early, has many young stems, is erect, rather smooth, purplish; coplets with a faint spot, nearly round, rather light colored.

Plant number 4—is early, stems numerous, spreading, quite hairy, purplish; coplets with a spot, prominent, dark in color.

Plant number 7—is early, stems many, large, erect, rather smooth, stem purplish; coplets spotted, rather broad, of good size, light green; flowers white.

Plant number 8—is late, stems few, stout, sprawling, quite smooth, purplish; coplets with scarcely a trace of a spot, rather narrow.

Plant number 10—has stems, very early, many, small, short, spreading, purplish, hairy; leaves few, small, rather round, a slight spot; heads small.

Plant number 11—has stems rather erect, rather hairy, green; leaves short.

Plant number 13—has small spot on coplets; stipules conspicuously striped with red.

Plant number 13—flowers bright scarlet, like Italian clover.

Plant number 17—is very late, stems long, of medium size, spreading about, quite hairy, green; leaves light green, spot conspicuous.

Plant number 18—is very late, pea vine, stems few, long, spreading from the first, heavy, purplish; coplets with a spot conspicuous, very narrow.

Plant number 19—is a seedling of dark seeds, stems early, many, tall, erect, smooth, purplish; coplets rather broad, very dark green, thick, no trace of spots; flowers dark colored. This is the best plant, all things considered, which I have seen.

It seems to me there is a grand chance for doing something to improve our red clover by selection and, perhaps, aided by breeding. We all know how wonderfully Indian corn varies. The plant is large and everybody sees it. The time required to get a race of corn is short—about 4 to 10 years. We gain in uniformity and excellence in some one or more respects. It looks as though we could do the same thing for red clover. This great variation in our fields of red clover is a broad hint at the results which may be attained by study and care. I believe our fields of red clover to-day contain nearly or quite as great a variety of plants as would a field of Indian corn if we were to mix in a little seed of all the varieties cultivated in any one State. I suppose for the Northern States we want a red clover which starts early, grows rapidly, has numerous, erect, stout, stems which are not large. The plant should endure dry weather well, and seed freely. The plant should be smooth throughout, with thick leaves.

I remember to have seen something written by an apiarist, who spoke of breeding and selecting bees with a view to get those with tongues long enough to take nectar from the flowers of red clover. To obtain this result, why not save the seeds of the red clover from which some honey bees are seen to gather nectar? Plant the seeds apart from others and repeat the operation. Our ideal red clover, then, will have a short corolla, to permit the visits of honey bees.

This autumn, since writing the above, I collected within about 10 feet of each other, some ripe clover heads from 5 different plants looking much alike. I selected 50 good heads from each lot. The seeds were shelled and counted.

50	heads	contained	1,260	seeds,
50	"	"	1,275	"
50	"	"	1,460	"
50	"	"	1,485	"
50	"	"	1,820	"

Between these extremes is a difference of nearly one-third in the number of seeds. My assistant selected a lot in another place, 50 heads of which contained 2,290 seeds, or nearly twice as much as the lowest of those above mentioned.

There is a marked difference in the color of seeds of different plants, though every seed in any one plant is not the color of every other seed. In some plants, nearly all the seeds were a light yellow; in others, purple on one side; while others were quite dark brown. Among those very dark were a few lighter in color.

NOTES ON PARASITIC FUNGI.

BY T. J. BURRILL.

APPLE SCAB. (Fusicladium dendriticum.)

Apple trees and fruit have suffered more in Illinois and the Northwest during the present season than, to my knowledge, they have ever suffered before from the injuries of this well know parasitic fungus. During the wet autumn of 1881, the leaves and twigs of that year's growth became the seat of a luxuriant development of the sooty fungus which continued on the latter in a living state during the very open winter. Last spring the conditions seemed also favorable for an unusual growth of the parasitic plant, so that as soon as the young leaves burst from the buds they were more or less covered and penetrated by the dark olive threads of the fungus. As a consequence, such leaves, often never reaching full size, were distorted, rolled at the edges, and finally ragged by the